

## Appendix 1. Conversions Between Imperial and Metric Measures

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To convert any item listed along the left margin of a table to the item heading a column, multiply by the factor at the intersection of the row and column. For example, to convert 850 kilograms into pounds, the factor in Table 3 is 2.205, hence the answer is 1,874 pounds.

**Table 1.** *Metric prefixes and corresponding mathematical factor.*

Prefix	Abbreviation	Factor
exa	E	$10^{18}$
peta	P	$10^{15}$
tera	T	$10^{12}$
giga	G	$10^9$
mega	M	$10^6$
kilo	k	$10^3$
hecto	h	$10^2$
deka	da	$10^1$
deci	d	$10^{-1}$
centi	c	$10^{-2}$
milli	m	$10^{-3}$
micro	$\mu$	$10^{-6}$
nano	n	$10^{-9}$
pico	p	$10^{-12}$
femto	f	$10^{-15}$
atto	a	$10^{-18}$

**Table 2.** *Useful ratios.*

From	To	Multiply by
kg/m <sup>3</sup>	lb/ft <sup>3</sup>	0.062428
m <sup>3</sup> /tonne	ft <sup>3</sup> /ton (short)	32.037
m <sup>3</sup> /ha	ft <sup>3</sup> /acre	14.2913
joule/kg	Btu/lb	0.0004296
lb/ft <sup>3</sup>	kg/m <sup>3</sup>	16.0185
ft <sup>3</sup> /ton (short)	m <sup>3</sup> /tonne	0.031214
ft <sup>3</sup> /acre	m <sup>3</sup> /ha	0.0699725
Btu/lb	joule/kg	2,326

Table 3. Conversion factors for mass and weight.

	mg	g	kg	tonne	oz (fluid)	lb	ton (short)	ton (long)
mg	1	0.001	$1 \times 10^{-6}$	$1 \times 10^{-9}$	$3.527 \times 10^{-5}$	$2.205 \times 10^{-6}$	$1.103 \times 10^{-9}$	$0.984 \times 10^{-9}$
g	1,000	1	0.001	$1 \times 10^{-6}$	0.03527	0.002205	$1.103 \times 10^{-6}$	$0.984 \times 10^{-6}$
kg	$1 \times 10^6$	1,000	1	$1 \times 10^{-3}$	35.27	2.205	$1.102 \times 10^{-3}$	$0.984 \times 10^{-3}$
tonne	$1 \times 10^9$	$1 \times 10^6$	1,000	1	35,270	2,205	1.103	0.9844
oz (fluid)	$2.835 \times 10^4$	28.35	0.02835	$2.83 \times 10^{-6}$	1	0.06250	$3.125 \times 10^{-5}$	$2.79 \times 10^{-5}$
lb	$4.536 \times 10^5$	453.5	0.4535	$4.535 \times 10^{-4}$	16	1	0.0005	$4.464 \times 10^{-4}$
ton (short)	$9.072 \times 10^8$	$9.072 \times 10^5$	907.2	0.9066	$3.2 \times 10^4$	2,000	1	0.8929
ton (long)	$10.16 \times 10^8$	$10.16 \times 10^5$	1,016	1.016	35,840	2,240	1.120	1

Table 4. Conversion factors for length and distance.

	mm	cm	m	km	in	ft	yd	mi
mm	1	0.10	0.001	$1 \times 10^{-6}$	0.03937	0.003281	0.001094	$6.214 \times 10^{-7}$
cm	10	1	0.01	$1 \times 10^{-5}$	0.3937	0.03281	0.01094	$6.214 \times 10^{-6}$
m	1,000	100	1	0.001	39.27	3.281	1.094	$6.214 \times 10^{-4}$
km	$1 \times 10^6$	$1 \times 10^5$	1,000	1	39,370	3,281	1.094	0.6214
in	25.40	2.540	0.02540	$2.540 \times 10^{-5}$	1	0.08333	0.02778	$1.578 \times 10^{-5}$
ft	304.8	30.48	0.3048	$3.048 \times 10^{-4}$	12	1	0.333	$1.894 \times 10^{-4}$
yd	914.4	91.44	0.9144	$9.144 \times 10^{-4}$	36	3	1	$5.682 \times 10^{-4}$
mi	$1.609 \times 10^6$	$1.609 \times 10^5$	1,609	1.609	63,360	5,280	1,760	1

Table 5. Conversion factors for area.

	cm <sup>2</sup>	m <sup>2</sup>	km <sup>2</sup>	ha	in <sup>2</sup>	ft <sup>2</sup>	yd <sup>2</sup>	mi <sup>2</sup>	acre
cm <sup>2</sup>	1	0.0001	1 x 10 <sup>-10</sup>	1 x 10 <sup>-9</sup>	0.1550	0.001076	0.0001196	3.861 x 10 <sup>-11</sup>	2.471 x 10 <sup>-8</sup>
m <sup>2</sup>	10,000	1	1 x 10 <sup>-6</sup>	0.0001	1,550	10.76	1.196	3.861 x 10 <sup>-7</sup>	2.471 x 10 <sup>-4</sup>
km <sup>2</sup>	1 x 10 <sup>10</sup>	1 x 10 <sup>6</sup>	1	100	1.550 x 10 <sup>9</sup>	1.076 x 10 <sup>7</sup>	1.196 x 10 <sup>6</sup>	0.3861	247.1
ha	1 x 10 <sup>8</sup>	10,000	0.01	1	1.550 x 10 <sup>7</sup>	1.076 x 10 <sup>5</sup>	1.196 x 10 <sup>4</sup>	3.861 x 10 <sup>-3</sup>	2.471
in <sup>2</sup>	6.452	0.0006452	6.452 x 10 <sup>-10</sup>	6.452 x 10 <sup>-8</sup>	1	0.006944	0.0007716	2.491 x 10 <sup>-10</sup>	1.594 x 10 <sup>-7</sup>
ft <sup>2</sup>	929.0	0.09290	9.290 x 10 <sup>-8</sup>	9.290 x 10 <sup>-6</sup>	144	1	0.1111	3.587 x 10 <sup>-8</sup>	2.296 x 10 <sup>-5</sup>
yd <sup>2</sup>	8,361.3	0.8361.3	8.361 x 10 <sup>-7</sup>	8.361 x 10 <sup>-5</sup>	1,296	9	1	3.228 x 10 <sup>-7</sup>	2.066 x 10 <sup>-4</sup>
mi <sup>2</sup>	2.590 x 10 <sup>10</sup>	2.590 x 10 <sup>6</sup>	2.590	259.0	4.014 x 10 <sup>9</sup>	2.788 x 10 <sup>7</sup>	3.098 x 10 <sup>6</sup>	1	640
acre	4.047 x 10 <sup>7</sup>	4.047 x 10 <sup>3</sup>	0.004047	0.4047	6.273 x 10 <sup>6</sup>	43,560	4.840 x 10 <sup>3</sup>	0.001563	1

Table 6. Conversion factors for geometric volume.

	mm <sup>3</sup>	cm <sup>3</sup>	m <sup>3</sup>	in <sup>3</sup>	ft <sup>3</sup>	yd <sup>3</sup>
mm <sup>3</sup>	1	0.001	1 x 10 <sup>-9</sup>	6.102 x 10 <sup>-5</sup>	3.531 x 10 <sup>-8</sup>	1.308 x 10 <sup>-9</sup>
cm <sup>3</sup>	1,000	1	1 x 10 <sup>-6</sup>	0.06102	3.531 x 10 <sup>-5</sup>	1.308 x 10 <sup>-6</sup>
m <sup>3</sup>	1 x 10 <sup>9</sup>	1 x 10 <sup>6</sup>	1	6.102 x 10 <sup>4</sup>	35.315	1.308
in <sup>3</sup>	1.639 x 10 <sup>4</sup>	16.39	1.639 x 10 <sup>-5</sup>	1	5.787 x 10 <sup>-4</sup>	2.143 x 10 <sup>-5</sup>
ft <sup>3</sup>	2.832 x 10 <sup>7</sup>	2.832 x 10 <sup>4</sup>	0.02832	1.728	1	0.03704
yd <sup>3</sup>	7.645 x 10 <sup>8</sup>	7.645 x 10 <sup>5</sup>	0.7645	46,656	27	1

Table 7. Conversion factors for volume and capacity.

	cm <sup>3</sup>	L	in <sup>3</sup>	ft <sup>3</sup>	oz (fluid)	qt	pt	qt	gal
cm <sup>3</sup>	1	0.001	0.06102	3.531 x 10 <sup>-5</sup>	0.03381	0.001057	0.002113	0.001057	0.0002642
L	1,000	1	61.02	0.03531	33.81	1.057	2.113	1.057	0.2642
in <sup>3</sup>	16.39	0.01639	1	5.787 x 10 <sup>-4</sup>	0.5540	0.01732	0.03463	0.01732	0.004329
ft <sup>3</sup>	28.320	28.32	1.728	1	957.5	29.92	59.85	29.92	7.481
oz (fluid)	29.57	0.02957	1.805	0.001044	1	0.03125	0.06250	0.03125	0.007812
pt	473.2	0.4732	28.88	0.01671	16	0.5	1	0.5	0.1250
qt	946.4	0.9464	57.75	0.03342	32	1	2	1	0.25
gal	3.785	3.785	231.0	0.1337	128	4	8	4	1

Table 8. Energy conversions.

	Btu	erg	foot-lb	gram calories	hp-hr	joule	kilogram calories	kilogram meters	kilowatt watts
Btu	1	1.0550 x 10 <sup>10</sup>	778.3	252.0	3.931 x 10 <sup>-4</sup>	1,054.8	0.2520	107.5	2.928 x 10 <sup>-4</sup>
erg	9.480 x 10 <sup>-11</sup>	1	7.367 x 10 <sup>-8</sup>	0.2389 x 10 <sup>-7</sup>	3.7250 x 10 <sup>-14</sup>	10 <sup>-7</sup>	2.389 x 10 <sup>-11</sup>	1.020 x 10 <sup>-8</sup>	0.2778 x 10 <sup>-13</sup>
foot - lb	1.286 x 10 <sup>-3</sup>	1.356 x 10 <sup>7</sup>	1	0.3238	5.050 x 10 <sup>-7</sup>	1.356	3.24 x 10 <sup>-4</sup>	0.1383	3.766 x 10 <sup>-7</sup>
gram calories	3.9685 x 10 <sup>-3</sup>	4.1868 x 10 <sup>7</sup>	3.0880	1	1.5596 x 10 <sup>-6</sup>	4.1858	10 <sup>-3</sup>	0.4270	1.1630 x 10 <sup>-6</sup>
hp - hr	2,547	2.6845 x 10 <sup>13</sup>	1.98 x 10 <sup>6</sup>	641,190	1	2.684 x 10 <sup>6</sup>	641.1	2.737 x 10 <sup>5</sup>	0.7457
joule	9.480 x 10 <sup>-4</sup>	10 <sup>7</sup>	0.7376	0.2389	3.7258 x 10 <sup>-7</sup>	1	2.389 x 10 <sup>-4</sup>	0.1020	2.778 x 10 <sup>-7</sup>
kilogram calories	3.968	4.1868 x 10 <sup>10</sup>	3,088	1,000	1.560 x 10 <sup>-3</sup>	4,186	1	426.9	1.163 x 10 <sup>-3</sup>
kilogram meters	9.294 x 10 <sup>-3</sup>	9.804 x 10 <sup>7</sup>	7.233	2.342	3.6536 x 10 <sup>-6</sup>	9.804	2.342 x 10 <sup>-3</sup>	1	2.723 x 10 <sup>-6</sup>
kilowatt hours	3,413	3.600 x 10 <sup>13</sup>	2.655 x 10 <sup>6</sup>	859, 850	1.341	3.6 x 10 <sup>6</sup>	8,690.5	3.671 x 10 <sup>5</sup>	1

Temperature Formulas: Celsius (Centigrade) =  $\frac{5}{9}$  Fahrenheit - 32  
 Fahrenheit =  $\frac{9}{5}$  Celsius + 32  
 Kelvin = Celsius - 273.15  
 Celsius = Kelvin + 273.15

